BURNER ASSEMBLY

BACKGROUND OF THE INVENTION

The invention to which this application relates is to a burner of the type which can be used and incorporated into larger apparatus, either in conjunction with other burners or independently to provide a flame and heat. In particular, the burner is for utilization in conjunction with a heat exchanger to supply flame to the heat exchanger.

The burner assembly type with which this application is particularly related is a burner which is arranged with a series of flameports each of which aligns with one of a number of heat exchanger tubes, hereinafter referred to as "HX Tubes".

Conventionally, when coupling a burner with a heat exchanger with a series of HX tubes, a separate burner is provided for connection to each tube. These burners are known as one gas in-shot types. The need to provide a separate burner for each HX tube means that separate connection of each burner is required for each tube which can increase assembly time and expense in the fittings required to be used. A further problem is that because each HX tube is connected with a separate burner then a specially designed housing is required to be provided to allow each of the burners to be mounted and to be mounted accurately so as to allow the same to be connected to the HX tubes as required. Once again, the provision of the specially designed housing adds to the cost of manufacture.

Because each HX tube has a separate burner, then each burner needs to be provided with an injector such that, again, a greater number of injectors are used than would be desired and, as a result of the number of injectors, a gas manifold is required to be formed to allow each of the injectors and hence burners to be supplied with gas.

In terms of performance, it is found that while there is some degree of premixing of gas and air, there are limitations due to the fact that the combustion chamber provided with

conventional burners is not sealed. This means that the burners can have problems in meeting the Standards which determine allowable gas emission levels, and in particular the nitrogen oxides (NOX) emission levels.

There are therefore significant commercial problems with conventional burners of this type. The burners are relatively complex in design, have a relatively large number of components and can require relatively intensive assembly. All of these problems add to the cost of the conventional burners of this type.

SUMMARY OF THE INVENTION

The aim of the present invention is to provide a burner assembly for connection to HX tubes and to provide a burner in a manner which allows a reduction in manufacture and assembly time of the same to be achieved, a reduction in the number of components required for the manufacture of the burner to be achieved and yet maintain or improve the performance of the burner.

In a first aspect of the invention there is provided a burner assembly, said burner assembly provided for connection to a series of spaced inlets to provide heat and/or flame, and wherein the burner assembly is provided with a plurality of ports or groups of ports therein through which pre-mixed gas/air mixture leaves said burner, said ports provided at spaced locations, so as to allow the inlets to be served by a common burner assembly.

In one embodiment the spacing of the ports or groups of ports matches the spacing of the inlets.

Alternatively, the ports or groups of ports are not necessarily aligned with the inlets. Thus, the configuration of the ports can be selected to suit the specific inlet configuration.

Typically the inlets are the inlets of the HX tubes of a heat exchanger, such as a multi

flue heat exchanger.

In one embodiment the burner includes a plate, said plate having the ports formed therein. It should be appreciated that in one embodiment the plate includes one port for each HX tube, said ports spaced on the plate to match the spacing of the HX tubes.

In an alternative arrangement, for each HX tube location a series of ports are provided as a group on the plate, said ports acting in combination to provide the flames or heat to said HX tube and again each of the groups of ports spaced to match the spacing of the HX tubes.

In another alternative arrangement one port or one group of ports may provide flames and/or heat to more than one inlet of a multiple flue HX and alternatively, multiple ports or groups of ports provide flames and/or heat to each single inlet of multiple flue HX.

Typically the plate (flamestrip) provided with the ports is mounted and located within a burner body. The body is formed, and the plate is positioned, such that a combustion chamber is defined on the side of the plate facing the HX tubes. This therefore means that the combustion chamber and hence combustion is common for each of the ports, and hence each of the HX tubes supplied via the ports.

Typically the burner assembly in accordance with the invention is provided with a single injector to supply gas into a cavity formed by the burner body.

In one embodiment, to further improve the mixture of the gas and air, a diffuser or distributor is mounted inside the gas inlet tube or the cavity.

Preferably the plate with the ports is secured to the body via flanges which are crimped in position. This therefore enables a common housing to be utilised with the plate and the configuration of the ports on the plate being selected to match the HX tubes configuration with which the burner assembly is to be provided. This allows the burner to be relatively easily tailored and adapted to suit particular uses.

In a further aspect of the invention there is provided a burner assembly, said burner assembly comprising a housing and body, said body provided with a gas supply leading into a cavity defined within the body, said cavity acting as a mixing chamber in which the gas and air mix and said mixture leaving the cavity via a number of ports, combusts and in turn leaves the burner assembly to a series of HX tubes which are provided in a predefined configuration, and wherein the ports are provided in a plate which defines one of the walls of the cavity.

In one embodiment said ports provided in a spaced configuration on the plate, said configuration matching the configuration of the HX tube inlets such that at least one of the ports is positioned adjacent each of the HX tube inlets.

In one embodiment the ports are in the form of circular apertures. In another embodiment the ports are in the form of slots and/or the ports are a mixture of shapes and/or dimensions to suit particular distribution requirements.

Similarly the gas/air mixture can be fully or partially premixed to suit particular requirements. The plate in which the ports are provided can also typically be referred to as a flamestrip and can be provided as an integral or removable element of the burner assembly.

DESCRIPTION OF THE DRAWINGS

Specific embodiments of the invention are now described with reference to the accompanying drawings wherein;

Figure 1 illustrates a burner assembly in accordance with one embodiment of the invention;

Figure 2a illustrates the plate of the burner of Figure 1 in accordance with one embodiment of the invention;

Figure 2b illustrates an alternative arrangement of the plate of the burner; and

Figure 3 illustrates a sectional view on line AA of the burner of Figures 1 and 2a in conjunction with a plurality of HX tubes.

Referring to the Figures, there is illustrated a burner in accordance with one embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The burner assembly comprises a body 2, typically fabricated from sheet metal but may also be a casting or of an equally gastight and durable construction. The body has a gas inlet 4 which supplies gas/air into cavity 8 in the body and defined by the inner faces of the rear and side walls of the body and the plate 10 which lies towards the front of the body. The cavity 8 acts as a mixing chamber. The gas and air mixture passes through the groups of ports 12, 14, 16, 18, 20 formed on the plate as shown, combust in the combustion chamber 24 in housing 26 and transfer heat through the HX tubes 22 as illustrated in the cross sectional view of Figure 3.

In Figures 1 and 2a the configuration of the ports in each groups comprise a larger center aperture surrounded by a series of smaller ports on an annular path. However the configuration and/or shape of the ports can be adjusted to suit particular gas flow and combustion requirements. Figure 2b illustrates an alternative arrangement where there is no central aperture provided in each group.

The sizing of the ports and the spacing of the ports in each set 12-20 are determined with respect to the heat and flame requirements to be provided to each HX tube 22 with which the burner assembly is mounted. Thus these parameters can be adjusted to suit particular heat exchanger parameters and can take into account any environmental considerations including emission regulations and standards.

Figure 1 and 2a illustrate a first arrangement wherein there are provided four groups of ports 12,14,16,18,20 each positioned with respect to the matching number of HX inlets 22. Figure 2b illustrates an alternative arrangement where, in this case, there is once again provided 5 HX inlets 22 but only four port groups 30,32,34,36. In this case the configuration of the ports in each group also differs from those in Figure 2a. It should also be appreciated

that in certain instances there may be required to be more ports or groups of ports in that plate than there is HX inlets to be supplied.

With regard to the spacing of the respective groups of ports 12-20, these spacings and the configuration of the groups are determined by the particular locations and shape of the plurality of HX tube inlets which are to be mounted in close proximity to the burner assembly as illustrated in Figures 2a, b and 3. In this example, a linear configuration is required and the spacing between the groups of ports in the linear configuration is dependent upon the spacing between the respective HX tubes.

For example, for a home heating furnace, 4 HX tubes or clamshell type similar arrangement are provided, of 1.5" diameter spaced at 2.750" centres. In this case the plate 10 is approximately 12" wide and 3" tall with the port groups 12-20 spaced at 2.75" to match the HX tube configuration.

Typically the plate 10 is crimped in position in the body 2 and therefore a plate with suitable port configurations can be selected from a range of plates with differing configurations of ports and relatively easily positioned with respect to a common housing/body design.

With the provision of the multiple groups of ports in the single body and the provision of the single gas injector 4, no gas manifold is required to be provided. Furthermore any configuration of the HX tubes can be addressed relatively easily without wholesale redesign of the burner body.

With regard to emission, the provision of the sealed housing allows the premix of gas and air and therefore a lowering of NOX emissions and, if required, a diffuser or distributor 30 can be provided inside the gas inlet tube or mixing chamber to optimise the gas air mixing. Alternatively, distribution plate 28 may be fixed adjacent to plate 10 to optimise

mixing when used with forced, fully premixed combustion systems. Finally, the plate load or open port area variation allows for mixing to achieve the required CO2 levels for required thermal efficiency.

Thus it will be readily appreciated that the burner assembly of the current invention as herein described provides significant advantages over the conventional burner assemblies used with HX tube configurations as in accordance with the invention a common gas inlet is used and a single burner assembly can be used to supply gas to a number of HX tubes. This therefore avoids the need for the conventional arrangement of a plurality of burner assemblies, one for each of the HX tubes.

While the invention has been described with a certain degree of particularly, it is manifest that many changes may be made in the details of construction and the arrangement of components without departing from the spirit and scope of this disclosure. It is understood that the invention is not limited to the embodiments set forth herein for purposes of exemplification, but is to be limited only by the scope of the attached claim or claims, including the full range of equivalency to which each element thereof is entitled.